In the Claims

Please conduct further examination of the present application based on the following list of claims:

47. **(Original)** A microfluidic device for mixing a plurality of fluid streams, the mixing device comprising:

a plurality of microfluidic inlet channels that merge into a microfluidic junction channel, the junction channel being defined in a first device layer and having a characteristic cross-sectional area; and

a plurality of contraction / expansion regions in fluid communication with the junction channel and arranged in series, each contraction / expansion region including:

an aperture defined in a second device layer, the aperture having a characteristic cross-sectional area that is substantially smaller than the area of the junction channel; and

a microfluidic expansion channel defined in either the first device layer or a third device layer, the expansion channel having a characteristic cross-sectional area that is substantially larger than the area of the aperture.

48. **(Original)** The mixing device of claim 47 wherein each aperture is less than about 250 microns in major dimension.

49. **(Original)** The mixing device of claim 48 wherein:

the junction channel contains a stream of multiple fluids;

upstream of an aperture, the stream of multiple fluids flows in substantially a first direction;

downstream of an aperture, the stream of multiple fluids flows in substantially a second direction that is substantially different from the first direction.

50. **(Original)** The mixing device of claim 49 wherein the second direction is at least about 90 degrees apart from the first direction.

51. **(Original)** The mixing device of claim 47 wherein any of the inlet channels, junction channel, or expansion channels are defined through the entire thickness of a stencil layer.

52. **(Original)** The mixing device of claim 47 wherein any of the inlet channels, junction channel, or expansion channels are defined in a surface but do not penetrate the entire thickness of a device layer.

53. **(Original)** The mixing device of claim 52 wherein any of the inlet channels, junction channel, or expansion channels are defined using one or more surface micromachining techniques.

54. **(Original)** The mixing device of claim 47 wherein the device is formed with multiple layers, and the various layers are bonded or fastened together.

55. **(Original)** The mixing device of claim 54 wherein the bonded or fastened layers form a substantially sealed device.

56. **(Currently amended)** A multi-layer microfluidic mixing device comprising:

a first device layer, a third device layer, and a second device layer disposed between the first device layer and the third device layer;

a plurality of microfluidic inlet channels that merge into a junction channel, the junction channel being defined in [[a]] the first device layer and having a characteristic width;

a slit defined in [[a]] the second device layer, the slit having a characteristic length and width and being ~~in fluid communication with the junction channel and~~ disposed lengthwise in a direction substantially parallel to the junction channel, the slit length being substantially greater than the slit width; and

a microfluidic outlet channel defined in [[a]] the third device layer and having a characteristic width , the outlet channel being ~~in fluid communication with the slit~~ disposed in a direction substantially perpendicular to both the junction channel and the slit;

wherein the slit is disposed between and in fluid communication with the junction channel and the outlet channel, the slit width is substantially smaller than the junction channel width, and the slit width is substantially smaller than the outlet channel width.

57. **(Canceled)**

58. **(Currently amended)** The mixing device of claim 56 wherein ~~the slit has a characteristic length, the outlet channel has a characteristic width, the slit has a characteristic length, and the length of~~ the slit length is at least as great as ~~the width of~~ the outlet channel width.

59. **(Currently amended)** The mixing device of claim 56 wherein ~~any of the inlet channels, junction channel, or outlet channel are defined through the entire thickness of a stencil layer~~ the first device layer is a first stencil layer, the third device layer is a third stencil layer, the junction channel is defined through the entire thickness of the first stencil layer, and the outlet channel is defined through the entire thickness of the third stencil layer.

60. **(Currently amended)** The mixing device of claim 56 wherein ~~any of the inlet channels,~~ the junction channel~~, or outlet channel are~~ is defined in a surface ~~but do~~ of but does not penetrate the entire thickness of [[a]] the first device layer and the outlet channel is defined in a surface of but does not penetrate the entire thickness of the third device layer.

61. **(Currently amended)** The mixing device of claim 56 wherein any of the plurality of inlet channels, the junction channel, or the outlet channel [[are]] is defined using one or more surface micromachining techniques.

62. **(Original)** The mixing device of claim 56 wherein the junction channel is substantially upstream of the slit, and the outlet channel is substantially downstream of the slit.

63. **(Currently amended)** The mixing device of claim 56 wherein ~~the device is formed with multiple layers, and the various layers~~ first device layer, second device layer,

and third device layer are bonded or fastened together to form a substantially sealed device.

64. **(Canceled)**

65. **(Canceled)**

66. **(Canceled)**

67. **(Canceled)**

68. **(Canceled)**

69. **(Canceled)**

70. **(Canceled)**

71. **(Canceled)**

72. **(Canceled)**

73. **(Canceled)**

74. **(Currently amended)** A microfluidic mixing device comprising:

a first device layer, a second device layer, and a third device layer disposed between the first device layer and the second device layer;

a first microfluidic channel defined in [[a]] the first device layer, the first channel having a characteristic width;

a second microfluidic channel defined in [[a]] the second device layer, the second channel having a characteristic width ; and

a plurality of apertures defined in the third device layer, the plurality of apertures being disposed between and in fluid communication with the first channel and the second channel, ~~the apertures being defined in a third device layer disposed between the first layer and the second layer~~ each aperture of the plurality of apertures having a major dimension that is substantially smaller than each of the width of the first channel and the width of the second channel.

75. **(Currently amended)** The mixing device of claim 74 wherein ~~the first channel has a characteristic width, the second channel has a characteristic width, and each aperture has a major dimension that is substantially smaller than~~ the width of the first channel is substantially equal to [[or]] the width of the second channel.

76. **(Currently amended)** The mixing device of claim 75 wherein the major dimension of each aperture of the plurality of apertures is less than about one-quarter of each of the width of the first channel [[or]] and the width of the second channel.

77. **(Original)** The mixing device of claim 75 wherein each aperture has a major dimension of less than about 200 microns.

78. **(Original)** The mixing device of claim 75 wherein each aperture has a major dimension of less than about 100 microns.

79. **(Currently amended)** The mixing device of claim 74 wherein the first channel has a characteristic cross-sectional area, the second channel has a characteristic cross-sectional area, each aperture has a characteristic cross-sectional area, and the area of each aperture [[us]] is substantially smaller than the area of the first channel and the area of the second channel.

80. **(Original)** The mixing device of claim 74 wherein the first channel is substantially upstream of the plurality of apertures and the second channel is substantially downstream of the plurality of apertures.

81. **(Currently amended)** The mixing device of claim 74 wherein the first device layer is a first stencil layer with the first channel being defined through the entire thickness of the first stencil layer and the second device layer is a second stencil layer with the second channel being ~~any of the first channel or the second channel are~~ defined through the entire thickness of [[a]] the second stencil layer.

82. **(Currently amended)** The mixing device of claim 74 wherein: ~~any of~~ the first channel ~~or the second channel are~~ is defined in a surface of [[a]] the first device layer but [[do]] does not penetrate the entire thickness of the first device layer; and

the second channel is defined in a surface of the second device layer but does not penetrate the entire thickness of the second device layer.

83. **(Original)** The mixing device of claim 82 wherein any of the first channel or the second channel are defined using one or more surface micromachining techniques.

84. **(Currently amended)** The mixing device of claim 74 wherein the first device layer, second device layer, and third device layer ~~device is formed with multiple layers, and the various layers~~ are bonded or fastened together.

85. **(Currently amended)** The mixing device of claim 74, further comprising a fourth device layer and a fifth device layer, wherein the first through fifth device layers are bonded or fastened ~~layers~~ together to form a substantially sealed device.